

Sacramento Municipal Utility District

SmartSacramento® Project

Abstract

Sacramento Municipal Utility District's (SMUD) SmartSacramento Project involves system-wide deployment of an advanced metering system integrated with existing enterprise and information technology systems as well as a partial deployment of advanced distribution grid assets that equip SMUD's distribution circuits with automated control and operation capabilities. The project also involves customer systems that provide usage and cost information to customers that educate and enable more control over their consumption. These systems enable more informed participation by customers and more effective management by SMUD to improve reliability and efficiency of grid operations and better optimize the use of assets. The project includes a field test of plug-in electric vehicle charging stations to assess their technical performance, vehicle charging patterns, and effects on electric distribution system operations.

Smart Grid Features

Communication infrastructure includes wireless systems that provide two-way communication for smart meters, customer devices, and distribution automation equipment. A new backhaul communications network, meter data relay network, and front-end data management system are being deployed throughout the SMUD service territory. Software platforms for meter data management and analysis are being installed to organize, integrate, summarize, and make data accessible from the smart meters. These systems provide SMUD with expanded capabilities to link customer information, electric distribution operations, and system-level reliability information.

Advanced metering infrastructure (AMI) includes the deployment of approximately 600,000 smart meters covering SMUD's entire service territory. This system provides automated meter reading, improved meter accuracy, enhanced outage response and notification, and improved theft detection. More detailed and timely data on peak electricity usage improves load forecasting and capital investment planning.

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At-A-Glance

Recipient: Sacramento Municipal Utility District

State: California

NERC Region: Western Electricity Coordinating Council

Total Budget: \$307,697,792

Federal Share: \$127,506,261

Project Type: Advanced Metering Infrastructure and
Customer Systems Electric Distribution Systems

Equipment

- Approximately 600,000 Smart Meters
- AMI Communication Systems
 - Meter Communications Network
 - Backhaul Communications
- Meter Data Management System
- Customer Web Portals
- Customer System Communications Network
- Customer Systems for up to 10,000 Customers
 - Home Area Networks
 - In Home Displays/Energy Management Systems
 - Programmable Communicating Thermostats
 - Direct Load Control Devices
- Distribution Automation Equipment for 102* Out of 635 Circuits
 - Distribution Automation Communications Network
 - SCADA Communications Network
 - Automated Distribution Circuit Switches
 - Automated Capacitors
 - Equipment Condition Monitors
- Up to 220 Electric Vehicle Charging Stations

*90 are 12kV and 21 kV circuits, and 12 are 69kV circuits.

Time-Variant Pricing Programs

- Time of Use
- Critical Peak Pricing

Key Targeted Benefits

- Reduced Electricity Costs for Customers
- Reduced Meter Reading Costs
- Reduced Costs from Distribution Line Losses
- Reduced Operating and Maintenance Costs
- Deferred Investment in Transmission and Distribution Capacity Expansion
- Improved Electric Service Reliability
- Reduced Ancillary Service Cost
- Reduced Congestion Cost
- Reduced Greenhouse Gas, Criteria Pollutant Emissions
- Reduced Truck Fleet Fuel Usage

Sacramento Municipal Utility District *(continued)*

Time-based rate programs include time of use, critical peak pricing, and time of use with critical peak pricing. Customers with smart meters selected to receive the new program rates can keep their existing rates or enroll in the new program. The aim is to evaluate the relative merits of these programs in terms of load impacts, customer acceptance, and cost effectiveness. SMUD expects to provide customers with greater control over their electricity bills and limit capital investment and emissions that result from adding peak generation capacity.

Advanced electricity service options include enhanced Web portal services and tools for customer information and energy management, control, and automation; the installation of up to 10,000 residential and small commercial Home Area Network devices to provide customers with options to conveniently control or manage their energy use based on lifestyle or operating choice; and the implementation of advanced energy management control systems with automatic demand response (AutoDR) capability at customer facilities. In combination with time-based rates, these service options provide customers with greatly enhanced tools to manage overall energy, reduce peak electricity demand, or shift their consumption from on- to off-peak periods.

Direct load control devices include programmable communicating thermostats and other devices that support load reduction or load shifting for air conditioners and other appliances and equipment during peak demand periods. Participating customers receive financial incentives in return for SMUD gaining the ability to turn off, or turn down, major appliances during times of system need. SMUD is installing the software platform for a demand response management system to provide more effective and centralized administration of direct load control operations and to enable a more robust two-way communication and feedback loop with its customers.

Time-based rate programs offered through this project include time-of-use rate and critical peak pricing. Refer to "Consumer Behavior Study" section below for more details on these rate programs.

Distribution automation systems include advanced automated equipment to improve the performance of distribution systems. SMUD is deploying automated switches, automated capacitor banks, remote fault indicators, and feeder monitors integrated with our energy management system on 102 distribution circuits. This equipment automatically responds to power disturbances and provides voltage regulation and isolates interrupted circuits. SMUD expects to reduce service interruptions and the frequency and duration of outages and the need for truck visits to maintain the distribution grid. Distribution automation assists the grid integration of solar and wind power installed on or near residences and commercial buildings.

Distribution system energy efficiency improvement is achieved through integrated voltage control from capacitor controllers and energy management system. The capacitors improve voltage, volt ampere reactive control, and power quality and increase distribution capacity by reducing energy losses on the distribution system.

Plug-in electric vehicle charging stations are being deployed at up to 40 parking spaces on college campuses and 180 residences across the SMUD service territory. These stations provide charging for plug-in electric vehicles. The charging stations also include meters and monitoring equipment to evaluate performance and charging patterns and their impacts on the distribution system.

Sacramento Municipal Utility District *(continued)***Consumer Behavior Study**

Sacramento Municipal Utility District's (SMUD) SmartSacramento project includes a consumer behavior study evaluating the impacts of time-based rates, enabling technologies, and recruitment treatments on energy consumption and peak demand.

Timeline

Key Milestones	Target Dates
Consumer behavior study begins	Q4 2011
AMI deployment completed	Q2 2012
Distribution automation deployment completed	Q1 2013
Customer system deployment completed	Q1 2013
Consumer behavior study evaluation completed	Q2 2014

Contact Information

Kevin Hudson
Project Development Manager
Sacramento Municipal Utility District
khudson@smud.org

Recipient Team Website: www.SMUD.org